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The give and take of black holes

 By **Dr David Whitehouse**

BBC News Online science editor

Scientists have found evidence of high-speed winds blowing away vast amounts of gas from the cores of two quasar galaxies.

"The winds we measured imply that as much as a billion suns' worth of material is blown away over the course of a quasar's lifetime," says George Chartas, of the Penn State Astronomy and Astrophysics Department, US, who led the observations.



Quasars are thought to be driven by supermassive black holes

Researchers speculate that the winds might also regulate the growth of the black hole at the centre of an active galaxy, and possibly spur the creation of new stars in the centres of galaxies as well.

Supermassive black holes, like those found at the centre of active galaxies, are notorious for ripping apart and swallowing stars. But their violence may have beneficial effects.

It might also help seed interstellar space with the elements necessary for life, such as hydrogen, carbon, oxygen and iron, say scientists.

Chandra and Newton

The wind seen coming from the central region of the active galaxies studied by orbiting observatories appears to originate from the disc of matter orbiting the black hole, called the accretion disc, once thought to consist of material destined only to fall into the black hole.

Researchers now suggest that a wind - created by the pressure of radiation - could blow away material from an accretion disc and seed interstellar space with heavier elements out of which stars could form with the right material to have a retinue of rocky planets, and possibly life.

George Chartas and his colleagues observed two quasars thought to be the bright cores of galaxies fuelled by a supermassive black hole.

With the Chandra X-ray Observatory in orbit, the astronomers observed a quasar called APM 08279+5255; and with the

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European Space Agency's XMM-Newton X-ray satellite, they observed a quasar named PG1115+080.

High-speed wind

APM 08279+5255 has its light magnified by a factor of about 100 and PG1115+080 by a factor of about 25 because of a process called gravitational lensing, which occurs when the light from distant objects becomes distorted and amplified by the gravity of intervening galaxies.

This natural boost in magnification allows the astronomers to see fine details around the black hole and determine important features about it, such as the speed of the gas and its proximity to the black hole.

The observations revealed evidence of a wind that blows carbon, oxygen and iron away from the black hole into the interstellar and intergalactic medium. The wind was moving at 40% of the speed of light, a high speed that surprised astronomers.

According to Niel Brandt, of the Massachusetts Institute of Technology, the new observation may spur new theoretical work about black hole winds and their effect on their environment.

"The wind might provide insight to the relationship between black hole mass and the central bulge of its host galaxy," he says.

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